Dr. Betsy Pugel interviews Dr. Waleed Abdalati for “Straight from the Scientist’s Mouth”

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Betsy: Ice. What is it? To you and me in the playa heat, ice is a source of relief in the form of cubes and crushed shards, but to Waleed Abdalati in the Cryospheric Sciences Branch at NASA’s Goddard Space Flight Center, ice is something altogether different.

Waleed: [The ice sheet on] Greenland is shrinking at an increasing rate. [The ice sheet on] Antarctica is shrinking.

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Waleed: And so we’re watching how the ice flows with satellites. We’re watching where it grows, where it shrinks. From space and from the air, we get a big-picture view in the right context, in the right perspective, to understand what the ice is doing.

If I could do one thing for this climate change debate, it would be to make it a national discussion that is not rooted in arguments among the extremes, but something everybody talks about, everybody seeks to learn about, and I think when we do that, we can all move forward as a society and do the right thing.

Betsy: Today on “Straight from the Scientist’s Mouth,” Dr. Abdalati will talk to us about what ice, one part of the living organism we inhabit [Earth], is telling us.

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Betsy: So, let’s start off simply. Why are folks monitoring the melting of the polar ice caps?

Waleed: Because the polar ice caps help keep the planet cool. They are largely responsible for the climate conditions we’ve come to know and love. They are also very sensitive to changes in climate, so they’re the first indicators of big things that might come down the road.

Betsy: Why does keeping the planet cool matter?

Waleed: Places are cold and places are warm, but on average the Earth has a certain temperature, and as we raise that temperature, we add energy to the Earth system, and adding energy kind of stirs the pot a little bit. It can potentially make storms more intense or more frequent. It can make rainfall heavier in some locations and drought more intense in others. So, increasing temperature is really equivalent to adding energy, which excites the climate in ways we may not be prepared for. Plus, we’ve grown to adapt to the climate[s] of our region[s]. Crops in the Midwest are what they are because the climate is conducive to that. You get corn in Kansas because that’s what the climate is optimal for.

If you start to change climate, make it warmer in a place like Kansas, then insects migrate northward, the soil conditions change, the precipitation conditions change, you've disturbed a system that you've evolved to work within in your local region. And, again, if we're not prepared for that or can't adapt for that readily, the consequences could be quite significant.

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Betsy: What drives the melting of the ice in the polar ice caps?

Waleed: A few things. The main thing is really just the sun and how ice interacts with the sun. Ice is white. It reflects the sun. When you look at it, it's reflecting about 80, 85 percent of the sunlight back to you. As it starts to melt and gets wetter, it gets darker and absorbs sunlight. When it absorbs that sunlight, it's taking in energy, which increases the amount of melt, which causes more energy to be absorbed, and so on.

So melt has kind of a runaway effect to a point where, if you start to peel back the ice and expose the ocean below, which is also very dark, that absorbs energy. Temperatures go up, more energy's absorbed, [and] more ice is melted. It's a self-compounding effect, so it really comes down to interaction between the sun and the ice surface.

Betsy: How fast are thing melting?

Waleed: Well, it depends on where you look. Some areas, particularly in the Antarctic, our ice is actually growing, but as a whole the Arctic sea ice cover is shrinking at a rate of about 10 percent per decade. This is the perennial ice, the stuff that survives the summer melt season. It's thick. It's hardy. It's been there awhile, and year after year it's getting smaller and smaller, at a rate of about 10 percent per decade, such that it may very well be that we'll have an ice-free Arctic in the summer in about 40 to 50 years.

Betsy: Really?

Waleed: It's remarkable, actually. There's some debate as to how long it's been since that happened, but the current thinking is a million years, perhaps even more. So that poses all kinds of challenges. When you peel back the ice from the Arctic Ocean, what does that do? All that sunlight strikes the ocean's surface, gets absorbed, warms the ocean, changes the ocean circulation, [and] changes the atmospheric circulation. The impacts of that could be tremendous.

Betsy: How can you slow the feedback loop that you describe?

Waleed: That's a tough question to answer. Fortunately nature interrupts that loop every year. Winter comes and the ice grows back, so what happens is the ice shrinks in the summer, and then fall comes. It starts to freeze and it grows and grows through the winter, and so we sort of reinforce this blanket of ice. We replenish it every year.

But as summer comes, the core, that central ice, that thicker ice, is getting smaller and smaller. So recovery from that will require a sequence of either very cold winters or cool summers that allow the ice—well in the case of cold winters, allow the ice to get so thick that it doesn't melt away as readily in the summer, or in the case of cool summers, it doesn't peel away at this ice layer so fast.

So, there are mechanisms that can reverse this, but as time goes on, as this process unfolds, it becomes more, and more, and more difficult to undo.

Betsy: And are we at a point where it's become really difficult to undo, or is there still hope?

Waleed: I think there's always hope, but the hope diminishes with time, and where we are on that continuum, I don't know. But I will say that, every year as I've watched this process unfold for the last—I don't know. I've been paying attention to it for about 10 years or so. I've become increasingly concerned, but I always hang onto hope. Things change. Processes, there are a lot of unknown processes, and the Earth is full of surprises. I don't like to count on surprises, though.

Betsy: How do you and your colleagues go about measuring variations in the ice and in the sea levels?

Waleed: Well, we tend to—I and my colleagues work with satellite data and aircraft data because they provide a really comprehensive picture of what's going on. These places are far [away]. They're hard to get to. They're dangerous, and they're big. So, going and sampling, taking your thermometer, dipping it in here and there, is a real challenge, and you just don't get all the information you need.

So we work with a number of satellites that look at—if I talk about sea ice in particular, the thin veneer of ice that blankets the Arctic Ocean, we use microwave data. [We] measure the microwave energy emitted from the ice. That tells us how expansive it is, how it's moving, how old it might be. We use visible data, just pictures, to look at it and its characteristics and distribution. We use thickness data that we can measure from space to try and estimate how thick, how vulnerable that ice is. That's sea ice, and I've been talking to you mostly about sea ice in this conversation.

There's also the ice sheets, the Greenland ice sheet, the Antarctic ice sheets, which have the potential to contribute huge amounts of water to sea level, causing sea level to rise. [The ice sheet on] Greenland is shrinking at an increasing rate. [The ice sheet on] Antarctica is shrinking, and so we're watching how the ice flows with satellites. We're watching where it grows, where it shrinks with sophisticated sensors that—from space and from the air, we get a big-picture view in the right context, the right perspective, to understand what the ice is doing.

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Betsy: What can our listeners do on a daily basis to help improve the health of our planet?

Waleed: First and foremost, pay attention. Educate yourself. Learn what's going on. When we take steps like that, when we become informed, when we exercise our rights as citizens, we can mobilize forces that can make big changes, bigger than any one of us can.

However, at the same time, we can take individual steps. Don't drive when you can walk or ride a bike. Don't turn your air conditioning so high. Don't turn your heat so high in the winter. If you can hang-dry clothes, skip the dryer. There are lots of little, little things. Everything we do takes energy. The question is, is it energy that has to go through some long productive process, or is it energy that we can generate ourselves by the food we eat? And I think if you stop and think about the energy that you're expending in your day-to-day actions, there are lots of strategies for minimizing that.

I remember in the '70s, there used to be a commercial when gas prices were really high, and there was this big energy shortage with the oil embargo, and it stuck with me. I was a kid at the time, but the guy said, "If we each save a little, we'll all save a lot." And I think that speaks very clearly to the individual contribution, but I can't stress enough: Learn, talk, engage, and act.

Betsy: Thank you.

Waleed: Thank you.

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Betsy: Thank you for joining us for another segment of "Straight from the Scientist's Mouth." For more information on the health of our ice on our planet, you can check out the link to our show on the Burning Man Web site. [www.burningman.com] You can also find information at www.nasa.gov/goddard. G-O-D-D-A-R-D. Thanks again.

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